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10/645,665	08/22/2003	Raj Dhindsa	2328-062	8414

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EXAMINER
LE, TUNG X

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2821	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/645,665	DHINDSA ET AL.	
	Examiner	Art Unit	
	Tung X. Le	2821	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *the Applicant's amendment 05/10/2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *15-23,25-51 and 64-79* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *42-51* is/are allowed.

6)☒ Claim(s) *15-23,25-33,35-37,39-41 and 64-79* is/are rejected.

7)☒ Claim(s) *34,38* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's communication amended on May 10, 2007 is acknowledged.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 15-23, 25-33, 35-37, and 39-41 are rejected under 35 U.S.C. 102(e) as being anticipated by Howard (U.S. 2005/0022933 A1).

With respect to claim 15, Howard discloses in figure 1 an apparatus for processing a workpiece (22 and 24) with a plasma (10) comprising a vacuum chamber (16) for processing the workpiece with the plasma (paragraph [0022]), and an electric source arrangement (12, 18, 20) for exciting the plasma with electric energy at three or more frequencies (paragraph [0023]) such that the excitation of the plasma by the three or more frequencies simultaneously causes different phenomena to occur in the plasma (paragraphs [007 and 0023]), wherein the phenomena affect plasma ion energy (paragraph [0009]), plasma ion density (paragraph [0008]) and plasma chemistry of the plasma incident on the workpiece (paragraph [0025]).

With respect to claim 16, Howard discloses in figure 1 a vacuum plasma processor (10) comprising a vacuum chamber (16) including an electrode (26 and 28),

the chamber being associated with a reactance (having a matchbox not shown), the electrode and the reactance being arranged for coupling plasma excitation fields to gas (having gases into reactive radicals and initiating a plasma) in the chamber (16), the chamber being arranged for carrying a workpiece (22) while the plasma excitation fields are coupled to the plasma (14), and a plasma excitation source arrangement (12, 18, 20) for enabling the electrode (28 and 26) and reactance (not shown - matchbox) to couple the electric energy at three or more frequencies (paragraphs [0023-0025]) to the plasma (14) incident on the workpiece (22), the three or more frequencies being such that the excitation of the plasma by the three or more frequencies simultaneously causes different phenomena to occur in the plasma (paragraphs [0007 and 0023]), wherein the phenomena affect plasma ion energy (paragraph [0009]), plasma ion density (paragraph [0008]) and plasma chemistry of the plasma incident on the workpiece (paragraph [0025]).

With respect to claim 17, Howard discloses that the plasma excitation source arrangement (12, 18, 20) is arranged for causing the three or more frequencies to be simultaneously applied to the plasma (figure 1, paragraph [0023]).

With respect to claim 18, Howard discloses in figure 1 that the electrode (26 and 28) for carrying the workpiece includes a first electrode (26) in the chamber and the reactance includes a second electrode (88) in the chamber (16).

With respect to claim 19, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) is arranged for applying a plurality of the frequencies

(paragraph [0023]) to the first electrode (26) and at least one of the frequencies, that differs from the plurality of frequencies, to the second electrode (28).

With respect to claim 20, Howard discloses in figure 1 that the plasma excitation source arrangement (70) is arranged for applying three or more of the frequencies (paragraph [0025]) to the electrode (18 and 26).

With respect to claim 21, Howard discloses in figure 1 that the first and second electrodes (26 and 28) and the source arrangement (12, 18, 20) are arranged for causing the second electrode to be at a reference potential and for simultaneously causing the source arrangement to apply the three or more frequencies to the first electrode (paragraph [0023]).

With respect to claim 22, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) includes at least one variable frequency RF source (paragraph [0023]).

With respect to claim 23, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) includes circuitry (30, 32, 34, 38) for (a) providing an impedance match (matchbox – not shown) between sources (12, 18, 20) of the frequencies and the plasma (14) and (b) decoupling the frequencies associated with the different sources from each of the other sources (figure 1).

With respect to claim 25, Howard discloses in figure 1 a vacuum plasma processor for a workpiece (22) comprising a vacuum chamber (16) including first and second electrodes (26 and 28) for supplying plasma excitation fields to a region (14) of the chamber adapted to be responsive to gas adapted to be converted into a plasma

(14) for processing the workpiece, the chamber being arranged for carrying the workpiece while the plasma exciting fields are supplied to the region, a plasma excitation source arrangement (12, 18, 20) for deriving electric energy at three or more frequencies (paragraph [0023]), the plasma excitation source arrangement including circuitry (30, 32, 34, 38) for selectively enabling coupling of the three or more frequencies (paragraph [0023]) to at least one of the first and second electrodes (26 and 28) for enabling plasma exciting electric fields at the three or more frequencies to be coupled to the plasma (figure 1).

With respect to claim 26, Howard discloses in figure 1 that the circuitry is arranged for coupling a plurality of the frequencies (paragraph [0023]) to the first electrode (26) and for coupling at least one of the frequencies to the second electrode (28), the at least one frequency being different from the plurality of frequencies (figure 1).

With respect to claim 27, Howard discloses in figure 1 that the circuitry is arranged for (a) providing an impedance match (matchbox) between sources (12, 18, 20) of the frequencies and the plasma (14) and (b) decoupling the frequencies associated with the different sources from each of the other sources (figure 1).

With respect to claim 28, Howard discloses that the plasma excitation source arrangement includes three or more different frequency sources (figure 1).

With respect to claim 29, Howard discloses that at least one of the sources has a variable frequency (figure 1 and paragraph [0023]).

With respect to claim 30, Howard discloses that at least one of the sources has a fixed frequency (figure 1).

With respect to claim 31, Howard discloses in figure 1 that various combinations of the three or more frequencies affect (a) the density of the plasma (b) the energy of ions in the plasma, and (c) the chemistry of the plasma (paragraphs [0008-0009 and 0023]).

With respect to claim 32, Howard discloses that at least one of the sources has a variable output power (paragraph [0023]).

With respect to claim 33, Howard discloses in figure 1 that the circuitry and the chamber (16) are arranged for preventing substantial current to flow at least one of the plurality of frequencies (paragraph [0023]) to the second electrode (28).

With respect to claim 35, Howard discloses in figure 1 that the circuit is arranged for connecting the second electrode (28) to a reference potential and for supplying the three or more frequencies (paragraph [0023]) to the first electrode (26).

With respect to claim 36, Howard discloses that the circuitry is arranged for supplying the same frequency to the first and second electrode (figure 1).

With respect to claim 37, Howard discloses in figure 1 that the plasma source arrangement (12, 18, and 20) is arranged for simultaneously coupling the three or more frequencies (paragraph [0023]) to the electrodes (26 and 28).

With respect to claim 39, Howard discloses that the controller (38) is arranged for selectively connecting the first electrode (26) to be responsive to each of the three or more frequencies (paragraph [0023]) during the first time period (figure 1)

With respect to claim 40, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) is arranged for applying three or more of the frequencies (paragraph [0023]) to the first electrode (26).

With respect to claim 41, Howard discloses that the first and second electrodes (26 and 28) and the source arrangement (12, 18, 20) are arranged for causing the second electrode to be at a reference potential and for simultaneously causing the source arrangement to apply the three or more frequencies to the first electrode (paragraph [0023]).

With respect to claim 66, Howard discloses that the plasma excitation source arrangement (12, 18, 20) is arranged for simultaneously applying the first and second frequencies to the first electrode (26) while applying the third frequency to the second electrode (figure 1).

With respect to claim 67, Howard discloses in figure 1 that the plasma excitation source arrangement (70) is arranged for simultaneously applying the first, second, and third frequencies to the first electrode (26) while the second electrode (28) is at a reference potential (paragraph [0023]).

4. Claim 15 is rejected under 35 U.S.C. 102(b) as being anticipated by Chen et al. (U.S. 2006/0175015 A1).

With respect to claim 15, Chen discloses in figure 1 an apparatus for processing a workpiece (121) with a plasma (100) comprising a vacuum chamber (102) for processing the workpiece with the plasma, and an electric source arrangement (150, 154, 160) for exciting the plasma with electric energy at three or more frequencies

(paragraphs [0031-0033]) such that the excitation of the plasma by the three or more frequencies simultaneously causes different phenomena to occur in the plasma, wherein the phenomena affect plasma ion energy, plasma ion density and plasma chemistry of the plasma incident on the workpiece (paragraphs [0007, 0044-0047).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 64-65, 68, and 69-79 are rejected under 35 U.S.C. 103(a) as being unpatentable over Howard et al. (U.S. 2005/0022933 A1).

With respect to claims 64-65 and 68, Howard discloses all of the claimed subject mater, as expressly recited in claims 15, 16, and 25, except for specifying that the first, second, and third frequency is in the range of 100 kHz to 10 MHz, 10 MHz to 150 MHz, and 27 MHz to 300 MHz, respectively. However, such a difference of the three frequencies is not of patentable merits since the range of the frequencies of the power sources can be selected at a desired level based on a particular application or environment of use and such a selection would have been involved with only routine skills in the art. Therefore, to employ the different frequency ranges of the power sources of Howard at the first, second, and third frequency is in the range of 100 kHz to 10 MHz, 10 MHz to 150 MHz, and 27 MHz to 300 MHz, respectively, to be suitable to a

desired application or environment of use would have been deemed obvious to a person skilled in the art.

With respect to claim 69, Howard discloses in figure 1 a vacuum plasma processor comprising a vacuum chamber (16) including an electrode (26 and 28), the chamber being associated with a reactance (matchbox), the electrode and the reactance being arranged for coupling plasma excitation fields to gas (having gas into the chamber) in the chamber (16), the chamber being arranged for carrying a workpiece (22) while the plasma excitation fields are coupled to the plasma (14), and a plasma excitation source arrangement (12, 18, 20) for enabling the electrode (26 and 28) and reactance (not shown) to couple the electric energy at three or more frequencies (paragraph [0023]) to the plasma (14) incident on the workpiece (22), except for specifying that the first, second, and third frequency is in the range of 100 kHz to 10 MHz, 10 MHz to 150 MHz, and 27 MHz to 300 MHz, respectively. However, such a difference of the three frequencies is not of patentable merits since the range of the frequencies of the power sources can be selected at a desired level based on a particular application or environment of use and such a selection would have been involved with only routine skills in the art. Therefore, to employ the different frequency ranges of the power sources of Howard at the first, second, and third frequency is in the range of 100 kHz to 10 MHz, 10 MHz to 150 MHz, and 27 MHz to 300 MHz, respectively, to be suitable to a desired application or environment of use would have been deemed obvious to a person skilled in the art.

With respect to claim 70, Howard discloses that the plasma excitation source arrangement (12, 18, 20) is arranged for causing the three or more frequencies to be simultaneously applied to the plasma (figure 1, paragraph [0023]).

With respect to claim 71, Howard discloses in figure 1 that the electrode (26 and 28) for carrying the workpiece includes a first electrode (26) in the chamber and the reactance includes a second electrode (88) in the chamber (16).

With respect to claim 72, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) is arranged for simultaneously applying the first and second frequencies to the first electrode (26) while applying the third frequency to the second electrode (28).

With respect to claim 73, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) is arranged for simultaneously applying the first, second, and third frequencies to the first electrode (26) while the second electrode (28) is at a reference potential (paragraph [0023]).

With respect to claim 74, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) is arranged for applying a plurality of the frequencies (paragraph [0023]) to the first electrode (26) and at least one of the frequencies, that differs from the plurality of frequencies, to the second electrode (28).

With respect to claim 75, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) is arranged for applying three or more of the frequencies (paragraph [0023]) to the electrode (26 and 28).

With respect to claim 76, Howard discloses in figure 1 that the first and second electrodes (26 and 28) and the source arrangement (12, 18, 20) are arranged for causing the second electrode to be at a reference potential and for simultaneously causing the source arrangement to apply the three or more frequencies to the first electrode (paragraph [0023]).

With respect to claim 77, Howard discloses that the plasma excitation source arrangement (12, 18, 20) includes at least one variable frequency RF source (figure 1).

With respect to claim 78, Howard discloses in figure 1 that the plasma excitation source arrangement (12, 18, 20) includes circuitry (30, 32, 34, 36, 38) for (a) providing an impedance match (matchbox – not shown) between sources (12, 18, 20) of the frequencies and the plasma (14) and (b) decoupling the frequencies associated with the different sources from each of the other sources (paragraph [0023]).

With respect to claim 79, Howard discloses in figure 1 that the excitation source arrangement (12, 18, 20) is arranged and the frequencies have values for causing three or more different phenomena to occur simultaneously in the plasma (paragraph [0023]).

Allowable Subject Matter

7. Claims 42-51 are allowed.

8. Claims 34 and 38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter:

Prior art of record fails to disclose or fairly suggest the following limitations:

- A vacuum plasma processor for a workpiece comprising a filter arrangement of the circuitry, the filter arrangement being connected to the second electrode for preventing the substantial flow of current at least one of the plurality of frequencies between the second electrode and the reference electrode, in combination with the remaining claimed limitations as claimed in dependent claim 34.
- A vacuum plasma processor for a workpiece comprising a reference potential during a first workpiece processing time period and for selectively supplying the same frequency to the first and second electrodes during a second workpiece processing time period, in combination with the remaining claimed limitations as claimed in dependent claim 38.
- A vacuum plasma processor for processing a workpiece comprising the electrode arrangement including first and second electrodes respectively on opposite first and second sides of the region and a third electrode on the first side of the

region, the third electrode being peripheral to and electrically insulted from the first electrode, a plasma excitation source arrangement for deriving electric energy at plural frequencies, the plasma excitation source arrangement being arranged for selectively coupling energy at the plural frequencies to the first, second and third electrodes for causing current at at least one of the plural frequencies to flow in the third electrode without current at all of the frequencies flowing in the third electrode, in combination with the remaining claimed limitations as claimed in claim 42 (claims 43-51 are allowed for depending on claim 42).

Response to Arguments

10. Applicant's arguments with respect to claims 15, 16, 25, and 69 have been considered but are moot in view of the new ground(s) of rejection.

Inquiry

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tung X. Le whose telephone number is 571-272-6010. The examiner can normally be reached on 8:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas Owens can be reached on 571-272-1662. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner
Tung Le
AU 2821

TRINH DINH
PRIMARY EXAMINER

May 15, 2007